

localities, differ somewhat in form and sculpture, a common occurrence in this genus. Both fall within the range of shell variation I have observed for the species. The radulae (figure 3) are practically identical.

I am indebted to Mr. Arthur Tucker Guest of Crawl, Bermuda, and Dr. Emily Vokes of Tulane University for the specimens, and to Mr. William Lyons, Florida Department of Natural Resources Marine Laboratory, St. Petersburg, Florida, for his advice and friendly criticism during the preparation of this paper.

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### **GREGGELIX, A NEW GENUS OF AUTOCHTHONOUS LAND SNAILS (HELMINTHOGLYPTIDAE) FROM BAJA CALIFORNIA**

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*Helix löhrü* Gabb, 1868, was described from a dead specimen (ANSP #58106) collected "from the higher table lands near Moleje" (i.e. Mulege of modern maps), Baja California Sur, Mexico; in accordance with Articles 27 and 32 (c) (i) of the International Code of Zoological Nomenclature (pp. 29, 35-36), the trivial name *löhrü* should be written *loehri* as will be done here.

*Sonorella lohrii* (sic) *lioderma* Pilsbry, 1904, was described from several dead specimens found "near Moleje, Lower California." Subsequently, Pilsbry (1916) raised *S. lioderma* to specific rank and figured the holotype. He then also synonymized *Helix steganella* Mabille, 1895, with "*Sonorella*" *loehri*. Other workers (G. D. Hanna and A. G. Smith, 1968) have placed *loehri* in the genus *Micrarionta* Ancy, 1880. However, thus far, the lack of data on the reproductive anatomy of *loehri* and *lioderma* has prevented their positive generic identification.

I am pleased to report that in December 1970, my son William Nixon Miller and I succeeded in collecting a large number of live *lioderma* specimens from two separate localities in San José Comondú and near La Purísima, Baja California Sur. Dissection

of these specimens reveals that they belong to a new genus of helminthoglyptids, described below. Their positive identification was made possible by comparison with two paratypes of *S. lioderma* kindly provided by the Academy of Natural Sciences of Philadelphia. A paratype of *lioderma* provided by the ANSP is shown in Plate 1, along with the shell of one of my dissected specimens, #5313-X, from La Purísima. The holotype of *Helix loehri* Gabb (ANSP #58106) was also provided by the ANSP for examination; it had the characteristic granular sculpture of the body whorl as described for that species.

In 1966, G Dallas Hanna visited the Paris Muséum d'Histoire Naturelle and examined and photographed some of Mabille's types of Baja California mollusks. Based on his observations, he and Allyn G. Smith (1968) then concluded that *Micrarionta peninsularis* (Pilsbry, 1916) was a synonym of *Helix indigena* Mabille, 1895; that *Helix steganella* Mabille, 1895, and *H. invecta* Mabille, 1895, were synonyms of *Micrarionta lohrii* (sic) Gabb 1868); and that *Helix digueti* Mabille, 1895 was a *nomen inquirendum* because the type material was not found.

I subsequently visited the Paris Museum in August 1971, and Mr. Henry Chevallier kindly showed me Mabille's types exactly as they had been set aside for Hanna, with the addition of the types of *Helix digueti*. It was immediately apparent that *Helix indigena* Mabille, 1895, p. 64, *Helix digueti* Mabille, 1895, p. 65, and *Sonorella lioderma* Pilsbry, 1904, are all the same species, with the name *indigena* Mabille, having priority. *Helix invecta* Mabille, 1895, p. 65, and *Helix steganella* Mabille, 1895, pp. 64, 65, are very heavily granulated shells very close to *H. loehri* Gabb. However, in the type of *H. loehri*, the granulations are located on the radial striae whereas in *H. invecta* and *H. steganella* the granulations are so thick as to obliterate any underlying striation. I have several lots of specimens sent to me by Munroe Walton and collected in 1970 by Charlotte Church (née Walton) from localities near San Javier, near Loreto, which completely match the sculpture of *H. invecta* and *H. steganella* but not that of the type of *H. loehri*. At present, no population with the characteristic sculpture of *H. loehri* has been rediscovered.

*Sonorelix peninsularis* (Pilsbry) is not a synonym of *Helix indigena* Mabille, and is a perfectly valid name.

Pending the procurement of live animals of *H. loehri* and *H. invecta*, it is premature to speculate on the specific or subspecific standing of these names. It appears most probable, however, that they are congeneric with *indigena*, which I place in the new genus described below.

GREGGELIX W. B. MILLER, *gen. nov.*

Type species: *Greggelix indigena* (Mabille, 1895)

I am pleased to name this new genus in honor of Wendell O. Gregg, friend and colleague, who introduced me to the snails of the desert southwest.

*Diagnosis:* The new genus *Greggelix* is distinguished from other genera in the family Helminthoglyptidae by the following anatomical characteristics of the reproductive system: No dart, dart sac, or mucus glands; a short verge (penis papilla); a very long epiphallic caecum and a very long spermathecal diverticulum, each from nearly as long to decidedly longer than the spermathecal duct.

*Description of the reproductive anatomy* of the type species, *Greggelix indigena* (Mabille, 1895) (Figure 1) is as follows:

The penis is short and saccular, equipped with a short, bulbous somewhat spherical verge. The epiphallus is about twice as long as the penis. The extremely long epiphallic caecum is compressed into about twenty tight coils which first wind distally from the epiphallus, then double back proximally and finally reverse again with the distal end lying loosely, uncoiled, in the body cavity. The coils are held tightly together by a blood vessel and connective tissue. A penial retractor muscle inserts on the epiphallus about midway along its length and attaches to the floor of the lung near the mantle collar.

The vagina is about equal in length to the penis. The spermathecal duct lies uncoiled along the uterus-prostate complex bound by connective tissue. The spermatheca is located in its usual position for helminthoglyptids, namely just posterior of the ventricle, held tightly appressed by connective tissue and a loop of the anterior aorta. A very long spermathecal diverticulum originates near the proximal end of the spermathecal duct and lies bound against the uterus in loose coils, with its distal end just anterior of the albumin gland. The albumin gland, hermaphroditic duct, and ovotestes are typically helminthoglyptid.

All specimens #5313 are from La Purísima Canyon, in a lava

diverticulum is noticeably shorter than in the other specimens but rockslide 3.0 mi. east of San Isidro along the road to Canipole; specimen #5309 is from San José Comondú in a rockslide at the edge of town along the road to San Javier. It is to be noted that in one of the La Purísima specimens (5313-C) the spermathecal

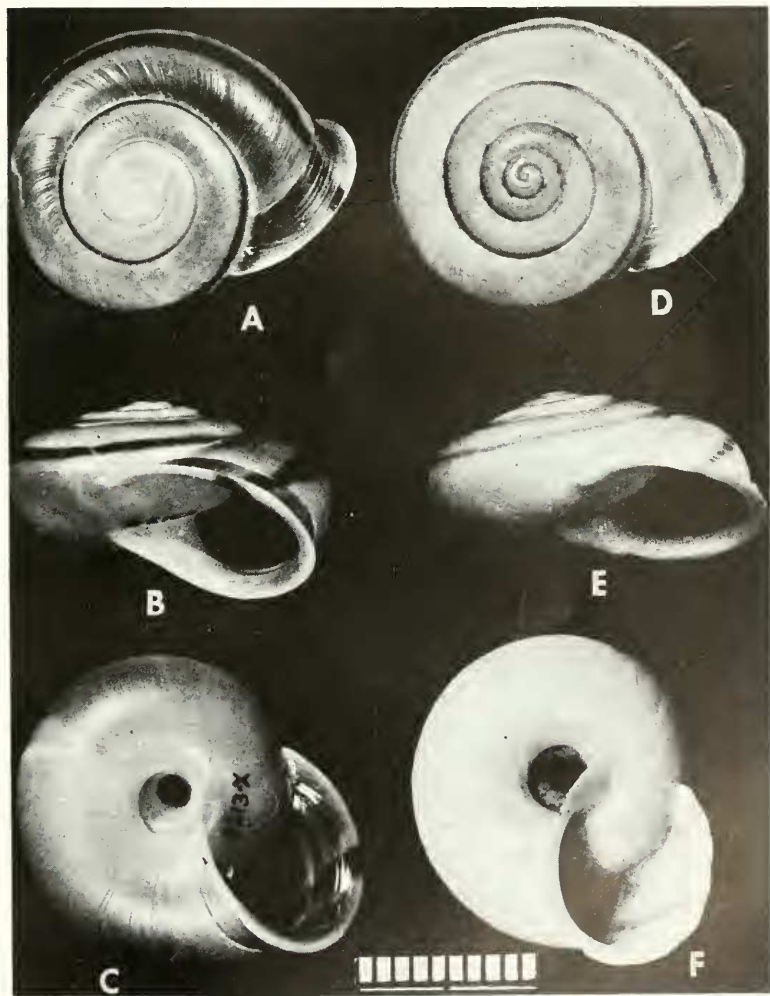
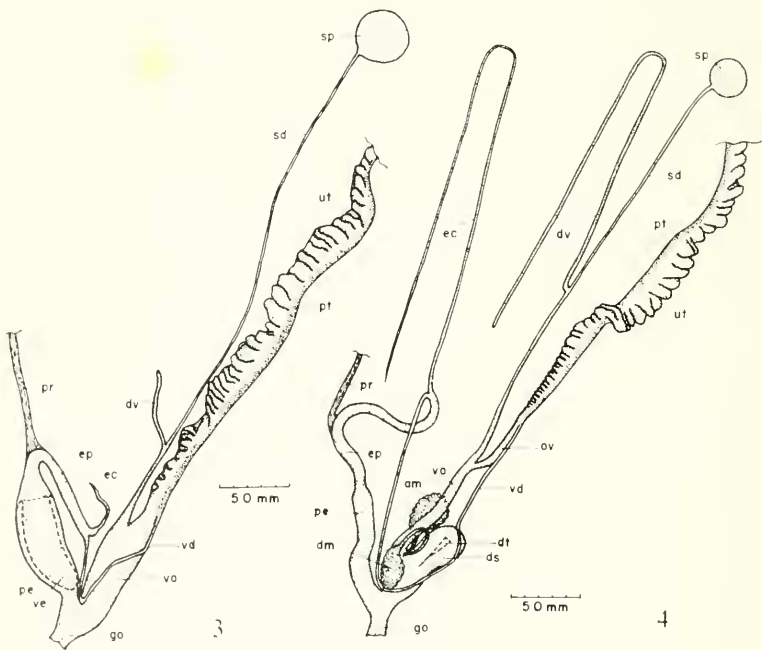
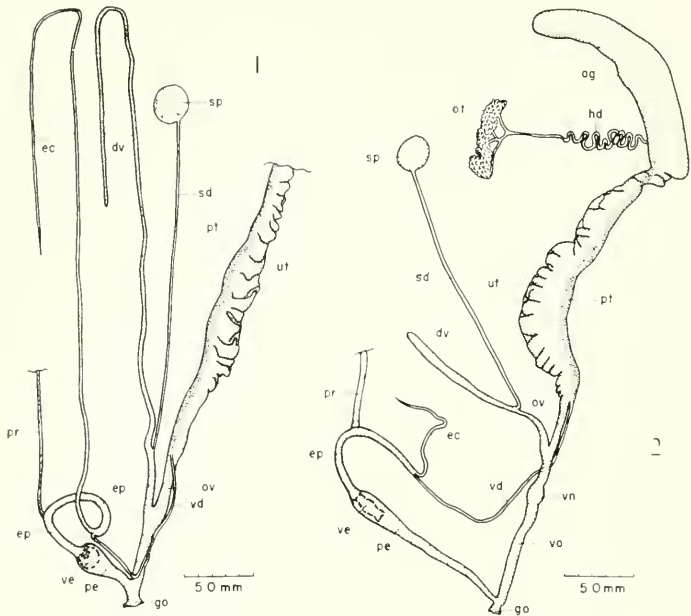


Plate 1. A—C. *Greggelix indigena* (Mabille), WBM #5313-X, La Purísima, Baja Calif. Sur. D—F. *Greggelix indigena* (Mabille) PARATYPE, ANSP #88367, "near Moleje, Lower California." Scale in mm.



## Measurements (length) in mm:

	5313-X (Fig. 1)	5313-A	5313-B	5313-C	5309
Penis	4	4	4	3	5
Verge	1.5	1.1	1.0	1.0	1.0
Epiphallus	11	11	10	10	12
Ep. caecum	57	58	54	59	61
Vagina	5	5	4.5	5	5
Spermathecal duct	28	28	30	30	34
Sp. diverticulum	47	46	41	30	32

is still as long as the spermathecal duct. The San José Comondú specimen (5309) has a somewhat longer penis than found in the La Purísima specimens, while its spermathecal diverticulum is slightly shorter than the spermathecal duct. Since it was the only live adult from that locality, no conclusions can be reached on whether these differences are consistent and significant.

Live specimens of both Comondú and La Purísima populations had the mantle collar pigmented greenish-yellow in contrast to the usual orange of most *Sonorelix* and *Sonorella*. This pigmentation is not considered a generic characteristic, but it is usually consistent at the subspecific or specific level.

## EXPLANATION TO OPPOSITE PAGE

Fig. 1. *Greggelix indigena* (Mabille, 1895). Lower genitalia. All drawings in figures 1-4 made from projection of stained whole mounts. Abbreviations used:

ag	albumin gland	ov	oviduct
am	ascending mucus gland	pe	penis
dm	descending mucus gland	pr	penial retractor
ds	dart sac	pt	prostate
dt	dart	sd	spermathecal duct
dv	spermathecal diverticulum	sp	spermatheca
ec	epiphallic caecum	ut	uterus
ep	epiphallus	va	vagina
go	genital orifice	vd	vas deferens
hd	hermaphroditic duct	ve	verge
ot	ovotestes	vn	vaginal node

Fig. 2. *Sonorelix (Sonorelix) borregoensis* (Berry, 1929). Genitalia. Fig. 3. *Sonorelix (Herpeteros) peninsularis* (Pilsbry, 1916). Lower genitalia. Fig. 4. *Micrarionta (Xerarionta) areolata* (Pfeiffer, 1845). Lower genitalia.



## DISCUSSION

This genus appears to be most closely related to *Sonorelix* Berry, 1943, *Sonorella* Pilsbry, 1900, *Mohavelix* Berry, 1943, and *Tryonigens* Pilsbry, 1928, in that all of these genera have lost the dart apparatus. Direct phylogenetic relationship among these dart-less genera is not to be inferred, however, since evidence tends to indicate that the loss of the dart apparatus has occurred more than once in the evolution of the helminthoglyptids (Miller 1970).

In order to compare the reproductive anatomy of *Greggelix* with that of *Sonorelix*, drawings were prepared from stained whole mounts of the genitalia of *Sonorelix* (*Sonorelix*) *borregoensis* (Berry, 1929) (Fig. 2) and *Sonorelix* (*Herpeteros*) *peninsularis* (Pilsbry, 1916) (Fig. 3). It can be seen that in both subgenera of *Sonorelix* the epiphallic caecum and the spermathecal diverticulum are much shorter than the spermathecal duct. There are other salient differences. The verge of *S. (Herpeteros)* is relatively enormously large and bulbous, a characteristic of the subgenus (Berry, 1947) found not only in *S. (H.) peninsularis* but also in *S. (H.) angelus* Gregg, 1948 and *S. (H.) inglesiana* (Berry, 1928) not figured here). The penis and vagina of *Sonorelix* s. s. are both unusually long and a muscular vaginal node is present; this is the case not only in *S. (S.) borregoensis* but also in *S. (S.) rixfordi* (Pilsbry, 1919), *S. (S.) melanopylon* (Berry, 1930) and *S. (S.) avawatzica eremita* (Pilsbry, 1939) all of which were also examined but not figured. Whether *Sonorelix* s. s. and *Sonorelix* (*Herpeteros*) are truly congeneric remains to be determined.

It is interesting to note that the unusually long epiphallic caecum and spermathecal diverticulum of *Greggelix* are found elsewhere only in certain species of *Helminthoglypta* and in *Micrarionta* (*Xerarionta*) (Fig. 4). A prolific population of *M. (X.) areolata* (Pfeiffer, 1845) occurs all along the Magdalena Plain of Baja California Sur, separated from the Comondú Canyon population of *Greggelix* by not more than ten miles. While one cannot infer phylogeny simply on size of spermathecal diverticulum and epiphallic caecum or on geographical proximity, it is tempting to hypothesize an ancestral *Xerarionta* population attempting to survive an increasingly drier climate in the rockslides of the Sierra de la Giganta and losing the dart apparatus through genetic drift and saltational speciation (Miller, 1970). An extensive survey of

chromosome numbers and karyotypes of many of the helminthoglyptid genera and subgenera has now been undertaken by Noorullah Babrakzai at the University of Arizona and it is possible that this will yield information useful in determining phylogeny more precisely.

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